

write to cache

when to send up?

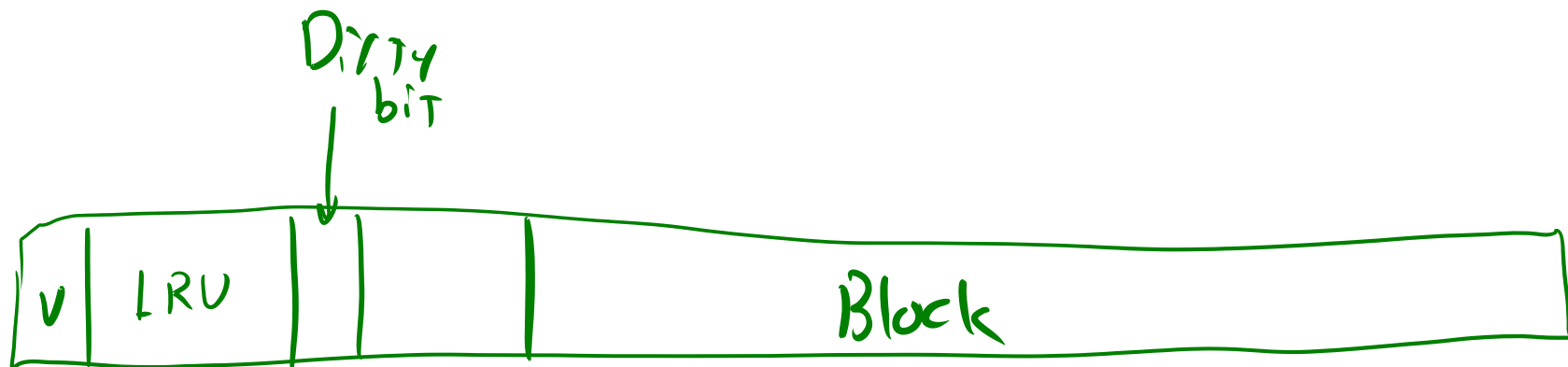
immediately

write-through cache

evict a line

write-back cache

cache  
line



load from store to cache: dirty = 0

write: dirty = 1

evict: if dirty, write back  
else, don't

Concurrently <sup>doing 2 things</sup>  $\supset$  in Parallel

both start before either end

$\supset$  instant when both are happening

Smith on 1 processor

$\leftarrow$  multiple cores

Overlapping classes

$\leftarrow$  fully overlapping classes

Turn-based race

reading two books

COAZ + SDE

# Concurrent +

Fibers  
greenlets  
Event queues

Non-preemptive threads

Process Thread

parallel

Cooperative

yield

Suspend

preemptive

interrupt

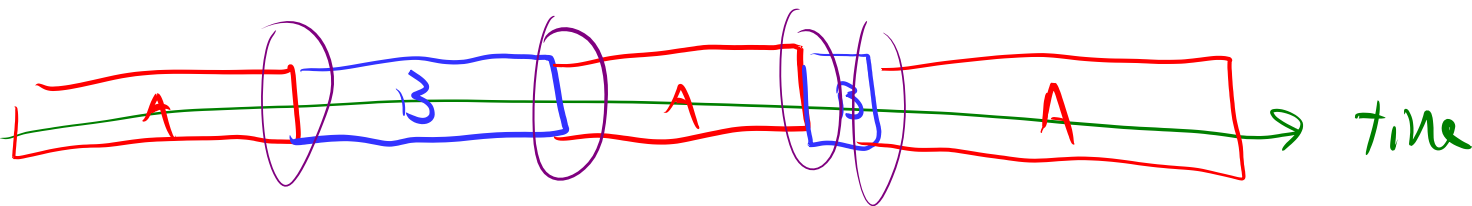
Suspend

D-



D~

D-



# Process

OS DS

PID - index into kernel array of Processes

each has full execution environ

- reg
- mem
- files
- Permission
- ...

# Thread

OS DS

TID - index into array of threads

minimal execution env

- reg
- stack

kernel - Scheduler

Match process, threads, and cores

